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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/728,804	12/08/2003	Kia Silverbrook	MTB01US	8902
24011	7590	04/11/2006	EXAMINER	
SILVERBROOK RESEARCH PTY LTD 393 DARLING STREET BALMAIN, NSW 2041 AUSTRALIA			LEBRON, JANNELLE M	
			ART UNIT	PAPER NUMBER
			2861	

DATE MAILED: 04/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/728,804	<b>Applicant(s)</b> SILVERBROOK, KIA	
	<b>Examiner</b> Jannelle M. Lebron	<b>Art Unit</b> 2861	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 27 January 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-54 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-54 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 12/16/04, 1/27/06
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1-7, 9, 11-12, 18, 19-26, 28, 30-31, 37, 38-43, 45, 47-48, and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Patent 5,706,041) in view of Shirota et al. (US Patent 6,076,919).

4. Regarding claims 1 and 19, Kubby discloses an ink jet printhead comprising:  
a plurality of nozzles, each defining an ejection aperture [column 1, lines 9-10]  
and,

at least one heater element corresponding to each of the nozzles respectively, the heater element configured for thermal contact with a bubble forming liquid [column 1, lines 17-23], such that,

heating the heater element to a temperature above the boiling point of the bubble forming liquid [column 5, lines 13-18] forms a gas bubble that causes the ejection of a drop of an ejectable liquid through the nozzle corresponding to that heater element [column 1, lines 23-26].”

Thus Kubby teaches the claimed limitations except “the heater element is less than 50 microns from the ejection aperture”.

Shirota et al. discloses a recording device where the distance between the heater (2 in fig. 8A) and the ejection outlet (5 in fig.8A) may preferably be 5-80 microns (column 4, lines 43-49). It would have been obvious to one of ordinary skill in the art at the time of applicant’s invention to provide a heater element positioned less than 50 microns from its corresponding nozzle. One would have been motivated to so modify Kubby to optimize the heater element as taught by Shirota et al.

5. Regarding claims 2-4 and 20-22, Kubby teaches the claimed limitations as set forth above except the claimed: “the heater element is positioned less than 25 microns from the ejection aperture (claims 2 and 20)”, “the heater element is positioned less than 10 microns from the ejection aperture (claims 3 and 21)”, and “the heater element is less than 5 microns from the ejection aperture (claims 4 and 22).”

It would have been obvious to one of ordinary skill in the art at the time the invention was made to position the heater element less than 25, 10, and 5 microns from

the ejection aperture for the purpose of utilizing an optimum range. The applicant should note that it has been held that where the general working conditions of a claim of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

6. The steps of the method claims 38-41 are deemed to be inherent in view of the functions of the apparatus disclosed above, since it would be necessary to perform the claimed method steps in order for the apparatus to perform its intended functions.

7. Regarding claim 5 and 24, Kubby discloses a printhead wherein "the bubble forming liquid and the ejectable liquid are of a common body of liquid (as seen in Figure 5)."

8. Regarding claims 9 and 28, Kubby discloses a printhead "configured to receive a supply of the ejectable liquid at an ambient temperature, wherein each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, from a temperature equal to said ambient temperature to said boiling point (column 5, lines 12-26)."

9. Regarding claims 11 and 30, Kubby discloses a printhead "wherein each heater element has two opposite sides and is configured such that a said gas bubble formed by that heater element is formed at both of said sides of that heater element (column 4, lines 59-63)."

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10. Regarding claims 12 and 31, Kubby discloses a printhead "wherein the bubble which each element is configured to form is collapsible and has a point of collapse, and wherein each heater element is configured such that the point of collapse of a bubble formed thereby is spaced from that heater element (column 4 lines 47-50)."

11. Regarding claims 18 and 37, Kubby discloses a printhead "wherein each heater element is substantially covered by a conformal protective coating, the coating of each heater element having been applied substantially to all sides of the heater element simultaneously such that the coating is seamless (column 4, lines 11-17)."

12. The method claims 42, 45, 47, 48, and 54 are deemed to be inherent in view of the functions of the apparatus disclosed above, since it would be necessary to perform the claimed method step in order for the apparatus to perform its intended function.

13. Regarding claims 6, 7, 25, and 26, Kubby discloses a printhead "being configured to print on a page and to be a page-width printhead (column 1, lines 45-49)" and wherein "each heater element is in the form of a cantilever beam (column 4, lines 47-50)."

14. Regarding claim 23, Kubby discloses a system "being configured to support the bubble forming liquid in thermal contact with each heater element, and to support the ejectable liquid adjacent each nozzle (column 3, lines 10-13)."

15. Regarding the claim 43, Kubby discloses a method “wherein the bubble forming liquid is fed to the at least one heater element so that it substantially surrounds the heater element (column 4, lines 59-63).”

16. Claims 8 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Patent 5,706,041) in view of Shirota et al. (US Patent 6,076,919) as applied to claim 1 above, and further in view of Silverbrook (US Patent 5,841,452).

Kubby in view of Shirota et al. teach the claimed limitation except “wherein each heater element is configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid thereby to cause the ejection of a said drop.”

Silverbrook teaches a thermal inkjet printer where “the heater energy is typically 200nJ per drop [column 18, lines 15-18].” It would have been obvious to one of ordinary skill in the art at the time of applicant’s invention to provide a heater configured to have an actuation energy of 200nJ. One would have been motivated to so modify Kubby in view of Shirota et al. to reduce the power dissipation without affecting print speed as taught by Silverbrook.

17. The method claim 44 is deemed to be inherent in view of the functions of the apparatus disclosed above, since it would be necessary to perform the claimed method step in order for the apparatus to perform its intended function.

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18. Claims 10 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Patent 5,706,041) in view of Shirota et al. (US Patent 6,076,919) as applied to claim 1 above, and further in view of Feinn (US Patent 6,543,879).

Kubby in view of Shirota et al. teach the claimed limitation except “comprising a substrate having a substrate surface, wherein the area density of the nozzles relative to the substrate surface exceeds 10,000 nozzles per square cm of substrate surface.”

Feinn teaches an inkjet printhead where “the area of the ink slot is at least approximately 100 nozzles per square millimeter ( $\text{mm}^2$ ) (Abstract – Column 1, lines 64-67).” It would have been obvious to one of ordinary skill in the art at the time of applicant’s invention to provide a printhead with a nozzle density of at least 10,000 nozzles per  $\text{cm}^2$ . One would have been motivated to so modify Kubby in view of Shirota et al. to improve the resolution of the printhead as taught by Feinn.

19. The method claim 46 is deemed to be inherent in view of the functions of the apparatus disclosed above, since it would be necessary to perform the claimed method step in order for the apparatus to perform its intended function.

20. Claims 13, 14, 32 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Patent 5,706,041) in view of Shirota et al. (US Patent 6,076,919) as applied to claim 1 above, and further in view of Silverbrook (US Patent 6,019,457).



Kubby in view of Shirota et al. teach the claimed limitation except “comprising a structure that is formed by chemical vapor deposition (CVD), the nozzles being incorporated on the structure.”

Silverbrook teaches a structure (142) that is formed by CVD [column 8, lines 66-67], whose thickness “can be about 4 microns [column 9, lines 8-9], and has nozzles incorporated to it [column 9, lines 9-10].” It would have been obvious to one of ordinary skill in the art at the time of applicant’s invention to provide a structure that is formed by CVD, wherein the structure is 10 microns thick and has nozzles incorporated to it. One would have been motivated to so modify Kubby in view of Shirota et al. to provide mechanical strength to resist the shock of exploding vapor bubbles and protection against external environment as taught by Silverbrook.

21. The method claims 49 and 50 are deemed to be inherent in view of the functions of the apparatus disclosed above, since it would be necessary to perform the claimed method steps in order for the apparatus to perform its intended functions.

22. Claims 15 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Patent 5,706,041) in view of Shirota et al. (US Patent 6,076,919) as applied to claim 1 above, and further in view of Komuro (US Patent 4,965,594).

Kubby in view of Shirota et al. teach the claimed limitation except “the heater elements within each chamber being formed on different respective layers to one another.”

Komuro teaches an inkjet printhead having a heater that is formed in a plurality on different layers [column 3, lines 35-65, Figure 1 and 2]. It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to provide a heater formed on different layers. One would have been motivated to so modify Kubby in view of Shirota et al. to produce a graded recording as taught by Komuro.

23. The method claims 51 is deemed to be inherent in view of the functions of the apparatus disclosed above, since it would be necessary to perform the claimed method steps in order for the apparatus to perform its intended functions.

24. Claims 16 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Patent 5,706,041) in view of Shirota et al. (US Patent 6,076,919) as applied to claim 1 above, and further in view of The Fabrication and Reliability Testing of Ti/TiN Heaters (DeMoor).

Kubby in view of Shirota et al. teach the claimed limitation except "wherein each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50."

DeMoor teaches that is desirable to use a heater made of Ti/TiN in integrated MEMS systems (a thermal inkjet is such a system), because this material provides the advantages of CMOS fabrication (low cost and uniformity) in combination with a very high reliability (see conclusion). Ti has an atomic number of 22. It would have been obvious to one of ordinary skill in the inkjet art at the time the invention was made to

have provided Kubby in view of Shirota et al. with a Ti/TiN heater. One would have been motivated to so modify Kubby in view of Shirota et al. to provide the advantages of CMOS fabrication (low cost and uniformity) in combination with a very high reliability, as taught by DeMoor.

25. The method claims 52 is deemed to be inherent in view of the functions of the apparatus disclosed above, since it would be necessary to perform the claimed method steps in order for the apparatus to perform its intended functions.

26. Claims 17 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Patent 5,706,041) in view of Shirota et al. (US Patent 6,076,919) as applied to claim 1 above, and further in view of Yamashita (US Patent 5,969,005).

Kubby in view of Shirota et al. teach the claimed limitation except "wherein each heater element includes solid material and is configured for a mass of less than 10 nanograms of the solid material of that heater element to be heated to a temperature above said boiling point thereby to heat said part of the bubble forming liquid to a temperature above said boiling point to cause the ejection of a said drop."

Yamashita teaches that the ink is jetted at an output of from 1 to 70 nanograms per droplet to effect recording (abstract, column 30, lines 29-32, lines 38-40, column 31, lines 18-22). It would have been obvious at the time the invention was made to a person having ordinary skill in the ink jet art to modify Kubby in view of Shirota et al. with the output of 1 to 70 nanograms per droplet to effect recording. One would have

been motivated to so modify Kubby in view of Shirota et al. to provide a greater surface area of the droplet, thus strongly improving image quality as taught by Yamashita.

27. The method claims 53 is deemed to be inherent in view of the functions of the apparatus disclosed above, since it would be necessary to perform the claimed method steps in order for the apparatus to perform its intended functions.

### ***Double Patenting***

28. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

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29. Claims 1-54 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 and 5-54 of copending Application No. 10/728,884 in view of Shirota et al. (US Patent 6,076,919).

30. Regarding claims 1-4 and 19-22, below is a table of comparison between claims to show their similarities:

<u>10/728,834</u>	<u>10/728,884</u>
<p>1. An ink jet printhead comprising: a plurality of nozzles, each defining an ejection aperture; and, at least one heater element corresponding to each of the nozzles respectively, the heater element configured for thermal contact with a bubble forming liquid, such that,</p> <p>heating the heater element to a temperature above the boiling point of the bubble forming liquid forms a gas bubble that causes the ejection of a drop of an ejectable liquid through the nozzle corresponding to that heater element;</p>	<p>1. An inkjet printhead comprising: a plurality of nozzles, each defining an ejection aperture; the bubble forming chamber adapted to contain a bubble forming liquid; and, at least one heater element disposed in each of the bubble forming chambers respectively, the heater elements configured for thermal contact with the bubble forming liquid; such that, the heater element can be heated to a temperature above the boiling point of the bubble forming liquid to form a gas bubble that causes the ejection of a drop of an ejectable liquid through the ejection aperture;</p>

31. Thus application 10/728,884 teach the claimed limitations except "the heater element is less than 50 microns from the ejection aperture (claims 1 and 19)", "the heater element is positioned less than 25 microns from the ejection aperture (claims 2 and 20)", "the heater element is positioned less than 10 microns from the ejection

aperture (claims 3 and 21)", and "the heater element is less than 5 microns from the ejection aperture (claims 4 and 22)".

Shirota et al. discloses a recording device where the distance between the heater (2 in fig. 8A) and the ejection outlet (5 in fig.8A) may preferably be 5-80 microns (column 4, lines 43-49). It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to provide a heater element positioned less than 50 microns from its corresponding nozzle to optimize the heater element as taught by Shirota et al.

Also, It would have been obvious to one of ordinary skill in the art at the time the invention was made to position the heater element less than 25, 10, and 5 microns from the ejection aperture for the purpose of utilizing an optimum range. The applicant should note that it has been held that where the general working conditions of a claim of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

32. Outstanding method claims 38-41 are similarly met by claim 38 of application 10/728,884 in view of Shirota et al. as discussed above with respect to the apparatus.

33. Claims 5-18, 23-37, and 42-54 of the present application are met by claims 5-18, 23-37, and 42-54 of 10/728884.

This is a provisional obviousness-type double patenting rejection.

***Response to Arguments***

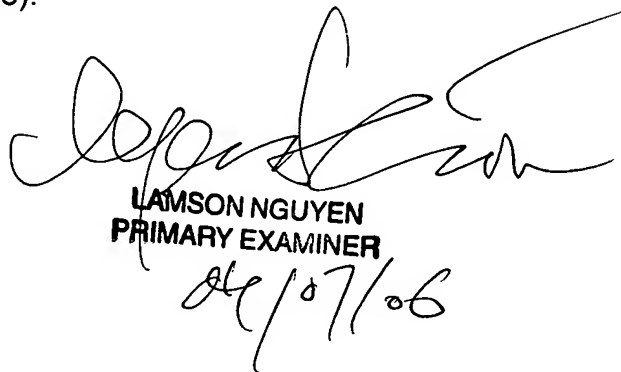
Applicant's arguments with respect to claims 1-54 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jannelle M. Lebron whose telephone number is (571) 272-2729. The examiner can normally be reached on Monday thru Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen D. Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JML  
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LAMSON NGUYEN  
PRIMARY EXAMINER  
04/07/06